Enforcement of NPDES Permits

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Introduction

National Pollution Discharge Elimination System (NPDES) permitted dischargers in South Carolina are required to report monthly monitoring data to South Carolina Department of Health and Environmental Control (SCDHEC). SCDHEC, in turn, is required to review the monitoring data to determine compliance with NPDES permitted limits and apply enforcement policies as needed. The NPDES permitting system is designed to control the overall pollutant loading to prevent adverse effects to human health and the environment. Recent contaminant values reported in the Charleston Harbor area have raised several questions surrounding the effectiveness of the NPDES permitting system.

The Charleston Harbor Water Quality Management Focus Group, in reviewing findings from the Charleston Harbor Project, acknowledged the fact that most of the research had been focused on evaluating the impacts of nonpoint source runoff on estuarine ecosystems and water quality. However, very little research had been focused on evaluating point source pollution and the effectiveness of the current NPDES permitting system including a review of compliance history and enforcement actions. As a result, a subcommittee of the Focus Group was created to review aspects of the NPDES permitting system regarding compliance histories of the fifteen most significant NPDES permitted dischargers in the Charleston Harbor watershed. The primary objectives of this committee are to: (1) review NPDES permits for the top fifteen dischargers in the Charleston Harbor watershed; (2) review compliance histories of these dischargers for the past ten years; (3) review enforcement actions of SCDHEC regarding non-compliance events. Data used for analysis has, and will be, obtained through the Freedom of Information Office of SCDHEC.

SCDHEC NPDES Enforcement Policy

According to Mr. David Graves at SCDHEC Bureau of Water, discharge pollutants are placed into two separate classes: (1) toxic pollutants (metals, chlorine, PAHs, PCBs, pesticides, etc.) and (2) non-toxic pollutants (total flow, total suspended solids, fecal coliforms, BOD, temperature, etc.). For toxic pollutants, discharge values exceeding 1.2 times the permit limit (e.g. a violation value greater than 1.2) is considered a "technical review violation". A value greater than 1.4 times the permit limit for a non-toxic pollutant is likewise considered a "technical review violation". Values between 1.0 and 1.2 or 1.4 respectively are considered a "chronic violation". More than two "technical review violations" in any six month period initiates enforcement action by SCDHEC. More than four "chronic violations" within a six month period will also initiate enforcement action.

Phase I

Phase I of this project involved requesting the appropriate information from the Freedom of Information (FOI) Office. After the first committee meeting, it was decided that NPDES permits, effluent monitoring data, and noncompliance histories (1986-1996) for the top fifteen dischargers in the Charleston Harbor area would be requested. On December 13, 1996, we received six of the fifteen NPDES permits requested from FOI. SCDHEC then expressed to us the difficulty of obtaining all of the information we had requested. After further discussions with SCDHEC Bureau of Water and FOI offices, it was decided that the initial request would be narrowed to include only compliance histories for three dischargers chosen by the committee. These three dischargers were Bayer Corporation (SC0003441), Westvaco (SC0001759), and Macalloy (SC0004014). Upon receipt of this information, data entry and analysis began immediately.

Phase II (Analysis/Methods)

Data analysis consisted primarily of determining yearly means for the self-reported monthly monitoring data. Data was presented in the monthly monitoring reports (DMR) as a value representative of each particular pollutant and discharge requirement (e.g. maximum, minimum, or average). Each monthly value for each particular pollutant was divided by the permitted discharge limit (for that particular pollutant) to achieve an integer representing a ratio of actual discharge to permit limit. We have preliminarily termed this value "violation value" as it appears on the figures. According to this calculation, if the violation value is less than one, then the discharger is in compliance with it's discharge permit. If a violation value is greater than one, the discharger is in violation of the NPDES discharge permit. These values have been averaged on a yearly basis providing a relative yearly history of compliance for each regulated pollutant.

The non-compliance reports provided by SCDHEC have also been used to develop a compliance history for each discharger. Violations have been divided into "technical review violations" and "chronic violations" as described above. Each of these have been summed and presented on a yearly basis. This information will provide the tool for evaluation of enforcement procedures in the next phase of this project.

Results

Analysis of data provided by SCDHEC indicated that Westvaco generally conformed to their permits between 70-100% of the time and Bayer 50-100% of the time, where as Macalloy was generally out of compliance with their permit the majority (>90%) of the time (Figure 1).

Detailed evaluation of the Macalloy permit compliance history generally indicated that there were permit exceedances for total chromium, hexavalent chromium and suspended solids. Figure 2 depicts the extent and nature of permit violations at Macalloy from

1990-96. The greatest exceedance of permit values at Macalloy were for suspended solids in 1994 (>81X the permit value) and hexavalent chromium in 1994 (>32X the permit value) (Figure 2). From 1990-93 and 1995-96, hexavalent chromium and total chromium discharges accounted for the majority (>80%) of total permit exceedances at Macalloy (Figure 3). In 1994, the majority (>50%) of total permit exceedances were for total suspended solids. A detailed evaluation of permit violation type for suspended solids indicate that most of the exceedances were for the LQAV and LQMX violations rather than LCAV and LCMX violations (Figure 4). A detailed evaluation of permit violation type for hexavalent chromium indicated that there were exceedances for all violation types (LCAV, LCMX, LQAV and LQMX) but that greatest exceedances occurred with LQAV and LQMX violations (Figure 5). These results generally suggest a pattern of noncompliance with the NPDES permit at Macalloy, which was not observed at Westvaco or Bayer. This is why SCDHEC has taken significant enforcement action against Macalloy.

At Westvaco, generally there was a consistent pattern of compliance with the NPDES permit. Evaluation o Biological Oxygen Demand (BOD), total suspended solids and effluent flow violations indicate that there was consistent compliance as MQAV and MQMX values were less than 60% of the permitted value (Figures 6-7 for outfall 001 and Figure [*] for outfall 002). The total number of Technical Review Violation (TRV=violations which are >1.2 of the permitted value for a toxic and >1.4 for a nontoxic parameter) and Chronic Review violations (CR=violations which are >1.0 but <1.2 of the permitted value for toxics and >1.0 but <1.4 for nontoxics) ranged from 0-1 for TRVs and for 0-4 for CRs from 1990-96 (Figure 9). From 1990-96 there were a total of 13 permit exceedances of which total suspended solids (62%) was the dominant cause followed by BOD (23%) and flow (15%) [Figure 10].

The Bayer Corporation had a permit which was much more detailed in terms of the number of contaminants which were monitored than the permits for Westvaco and Macalloy. The total number of TRVs ranged from 0-10 while the number of CRs ranged

from 0-4 (Figure 11). From 1989-96, there were a total of 35 TRV and CR violations. These violation exceedances were dominated by organic solvents including exceedances for chloroform (29%), methylene chloride (15%) and chlorobenzene (14%) (Figure 12).

Conclusions

Evaluation of three selected NPDES permits (Macalloy, Westvaco and Bayer) from the Charleston Harbor estuary indicated that in general most industries were in compliance with their permit the majority of the time. An exception was Macalloy which appeared to be in violation of their permit the majority (>90%) of the time for several permitted toxic and nontoxic parameters and at levels far in exceedance (>81X for total suspended solids and >32 for hexavalent chromium [?] of permitted values. SCDHEC has taken enforcement action against Macalloy and should continue to rigorously review its permit to push for more consistent permit compliance. At Westvaco and Bayer there were only occasional (generally less than 10-20% of the time [?] exceedances of NPDES permits at levels only slightly greater than the permitted value (generally less than 2X). In general, Westvaco and Bayer had good compliance history with their NPDES permits.

Phase III

After careful evaluation of the results in Phase II, these analytical methods were then applied to the remaining Charleston Harbor review sites. These sites included the Felix C. Davis Wastewater Treatment Plant (SC0024783), the Plum Island Wastewater Treatment Plant (SC0021229), Mt. Pleasant Water and Sewer Works, Center Street (SC0040711), the City of Moncks Corner (SC0021598), the Hanahan Wastewater Treatment Plant (SC0040266), the Daniel Island Wastewater Treatment Plant (SC0047074), the E.I. duPont deNomours and Co., Inc., Cooper River Plant (SC0026506), Nucor Steel, Berkeley Plant (SC0047392), Texaco Lubricants of North American (SC0003026), and the Foster Wheeler Charleston Resources Recovery site (SC0041173). As in Phase II, permit exceedances (maximum and average concentrations) were divided by the discharge permit limit to give the 'violation value.' For the minimum pH requirements, violation values were obtained by dividing the permit limit by the exceedance value. For toxic pollutants, violation values of between 1.0 and 1.2 were listed as Chronic Review Violations (CRs), while values exceeding 1.2 were considered as Technical Review Violations (TRV). Likewise, violation values between 1.0 and 1.4 were classified as CRs for non-toxic pollutants, and values that exceeded 1.4 were listed as TRVs. Two of the sites listed above, the Hanahan and Daniel Island Wastewater Treatment Facilities had no recorded water samples during the review period. In addition, Nucor Steel had only four recorded samples during the same time frame, all of which were CR's.

Results

During the review period, 212 water samples were taken at the Felix Davis Wastewater Treatment Plant. Pollutants sampled at this site included ammonia-nitrogen, pH, total suspended solids, fecal coliform, biochemical oxygen demand (BOD), flow in conduit, and

total residual chlorine. 100% of the samples taken of these non-toxic pollutants had measure concentrations above the permit limit with the exception of ammonia-nitrogen, which had no exceedances. Total residual chlorine and fecal coliform gave the highest percentage of technical review violations per total samples collected with 95% and 84%, respectively. In contrast, only 9% of the pH samples taken were TRVs (See Figure 1). Both fecal coliform and total residual chlorine also gave the highest recorded permit exceedances. The highest fecal coliform concentration, collected in September 1990, had a value 42.5X greater than permit limit (LCMX), while the highest recorded total residual chlorine concentration, collected in May 1989, had a value 12.5X greater than the permit limit (LCMX). Two-year averages of fecal coliform levels (LCMX) during the review period were at least 3X greater than the permit limit (See Figure 2). Similarly, yearly average residual chlorine concentrations ranged from a low of approximately 1.3 to a high of 6.5 times greater than the permit limit (See Figure 3).

Out of 78 samples collected at Charleston CPW, Plum Island site during the review period, 60 exceeded the permit limit. These exceedances included 21 critical review violations and 39 technical review violations. Of the pollutants sampled, fecal coliform had the most violations. This pollutant accounted for >92% of all TRVs and >52% of all CRs. The highest exceedance in this category had a level 15X greater than the permit limit (LCMX). Yearly averages for fecal coliform during the review period were at least 2.5X greater than the permit limit (See Figure 4). In contrast, flow in conduit samples were in compliance 72% of the time and had no technical review violations. In 1996 there were no flow exceedances recorded, while in 1995, there was only one flow sample out of 17 that exceeded the permit limit. Of the five total residue chlorine samples taken, three were found to be technical review violations, and two were critical review violations. The highest residual sample was 3X greater than the permit limit (LCMX).

Analysis of the data collected at the Mt. Pleasant Center Street site revealed 34 exceedances out of 39 samples collected. These exceedances included 11 TRVs and 23 CRs. As with the Plum river site, fecal coliform accounted for the most violations. Of the six fecal coliform samples taken during the review period, five were found to be technical review violations. The highest exceedance in this category was 400X the permit limit (LCMX). Total suspended solids also had a large number of violations. Of the eight samples taken in this category, four were TRVs and two were CRs. Similarly, out of nine BOD samples taken, two were TRVs and five were CRs. In contrast, the flow in conduit category had no TRVs out of the 15 samples collected. The highest exceedance for flow in conduit was 1.35X greater than the permit limit (LQMX).

At the City of Moncks Corner location, 24 water samples were collected during the review period, including 20 for flow in conduit, two for BOD, one for fecal coliform, and one for total suspended solids. All samples taken exceeded the permit limits. Of these exceedances, four were technical review violations. These TRVs included two for flow in conduit, one for fecal coliform, and one for total suspended. The two highest exceedances recorded at this site were for fecal coliform (3X the permit limit; LCMX) and total suspended solids (1.7X the permit limit; LCMX).

Analysis of data provided by SCDHEC indicated that duPont Cooper River Plant was in compliance more than 96% of the time. Water samples collected at this site primarily consisted of PAHs, BTEX compounds, and chlorinated toxic pollutants such as benzo(a)pyrene, fluoranthene, toluene, benzene, and chloroform. Non-toxic pollutants sampled included pH and total suspended solids. Out of the 114 water samples taken during the review period, four exceeded the permit limit. The four exceedances consisted of two technical review violations for chloroform, one chronic violation for acrylonitrile, and one chronic violation for total suspended solids.

Evaluation of the permit compliance history of Texaco Lubricants of North America revealed a high number of exceedances for pH, BOD, and grease and freon levels during the review period. Out of eleven water samples taken, 10 had values that exceeded the permit limit. Of the five BOD samples collected, one was below the permit limit and four were CRs. Of the five grease and freon samples taken during this period, all were TRVs. The highest recorded exceedance for grease and freon concentrations was greater than 9.5X the permit limit (LCMX). The only pH sample taken during the review period had a value of 6.0 with a minimum permit pH limit of 6.5.

At Foster Wheeler Resource Recovery, 27 water samples were collected during the review period, 17 of which exceeded the permit limit. However, of these exceedances, only 3 were technical review violations. Two of the TRVs were for free available oxidants (out or six samples collected) and one was for total solids (out of one sample). All five samples for water temperature were chronic review violations as were all four pH samples. In contrast, only one out of 11 oil and grease freon samples exceeded the permit limit. The highest exceedances recorded at this site were for free available oxidants (3X permit limit; LCMX), and the single exceedance for oil and grease freon (>2.8X permit limit; LCMX).

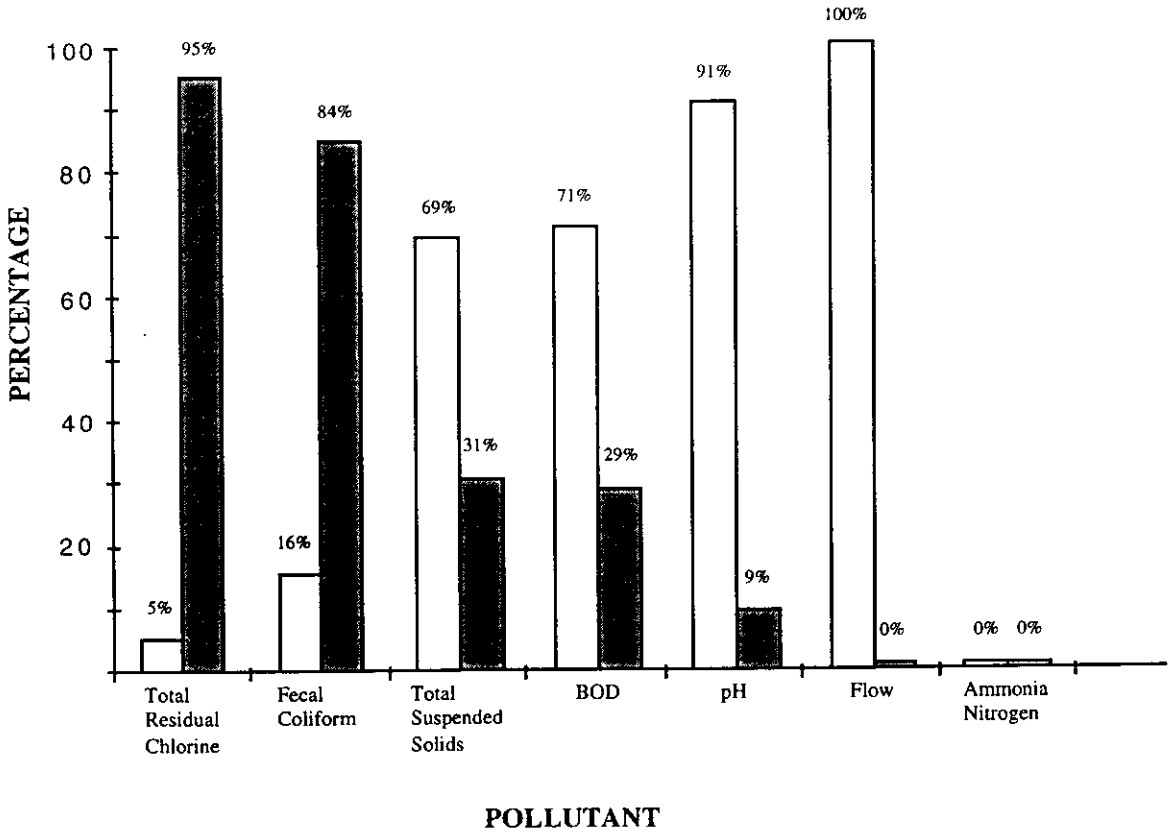

Figure 1: Percentage of non-toxic pollutant samples collected at the Felix Davis Waste Treatment Plant that were chronic review violations ( ) and technical review violations (■). Note the high percentage of technical review violations for both total residual chlorine and fecal coliform. Also note that ammonia nitrogen had no permit violations during the review period.

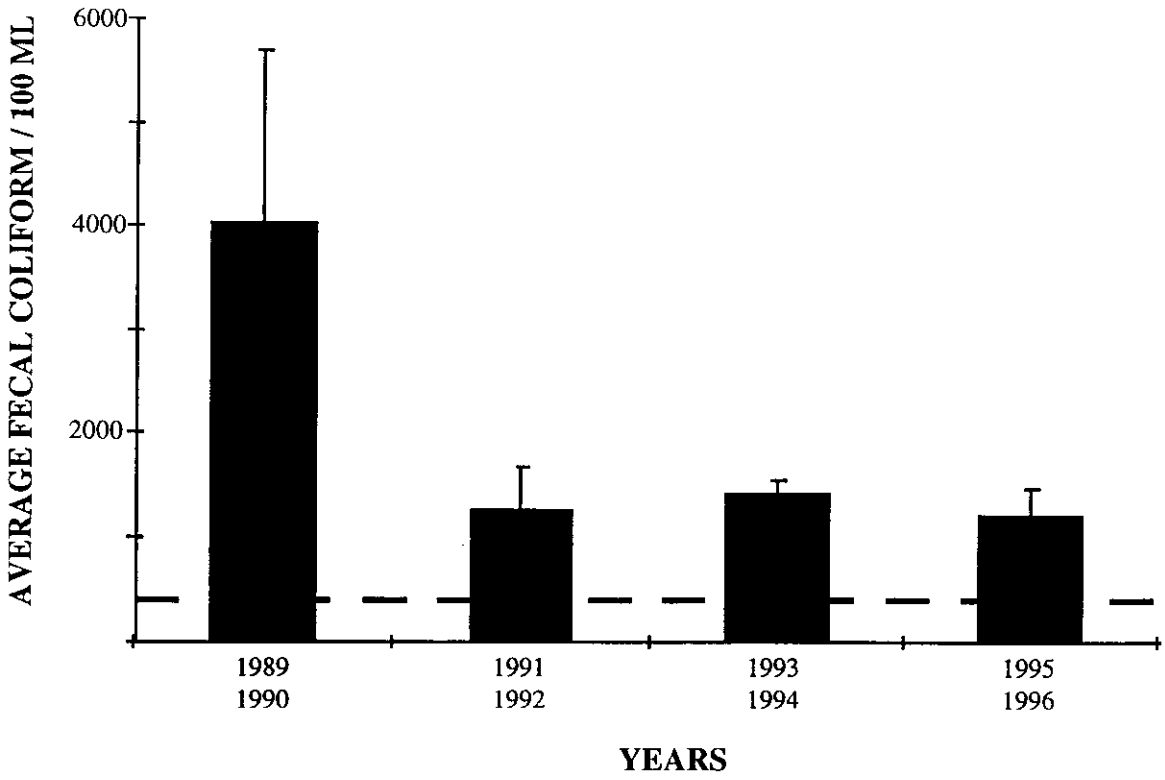

Figure 2: Two year averages (+/- S.E.) of fecal coliform samples (LCMX) collected at the Felix Davis Wastewater Treatment Plant. Individual years were combined into two year time periods because of low samples sizes. Note that the two year averages were at least three times the permit limit of 400 fecal coliform / 100 ml (- - -).

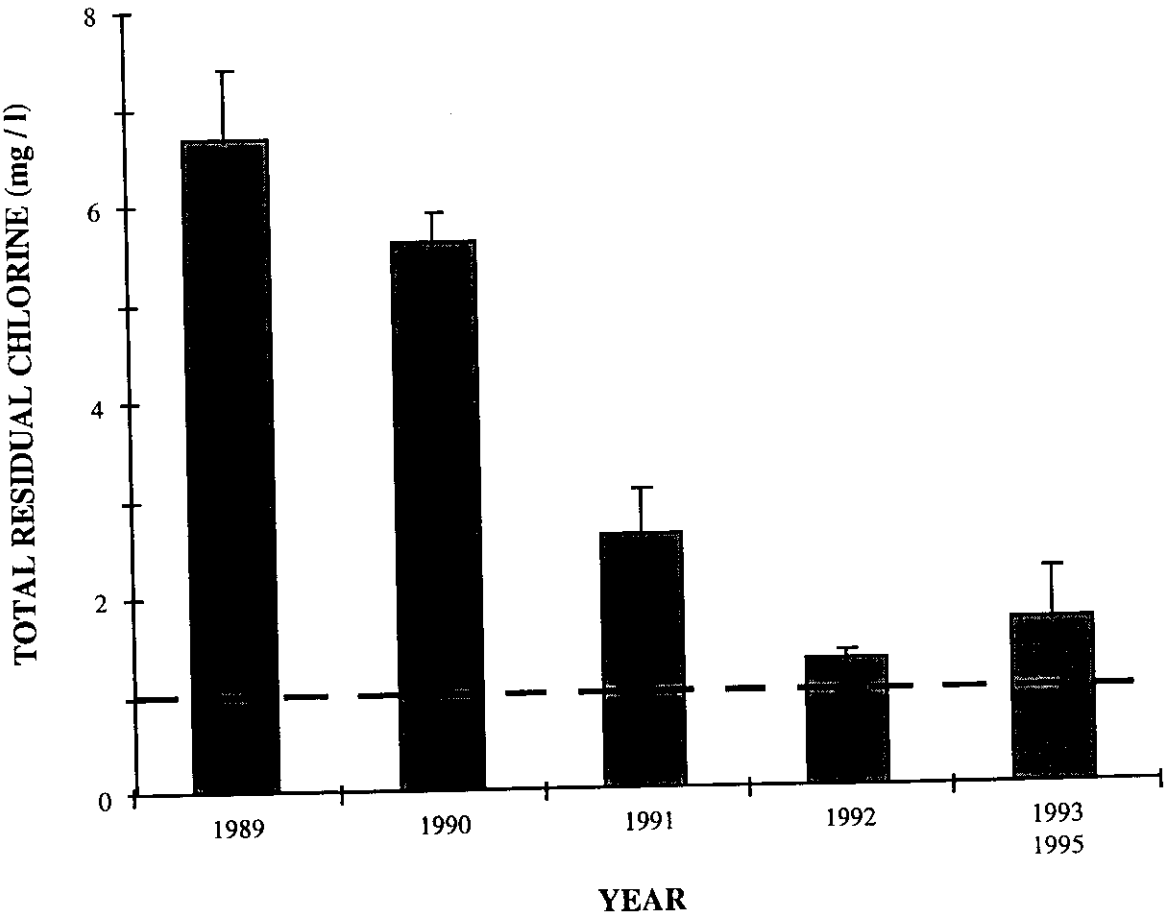

Figure 3: Yearly averages (+/- S.E.) for total residual chlorine (LCMX) collected at the Felix Davis Wastewater Treatment Plant with given daily maximum permit limit (- - -). The one sample collected in 1995 was combined with samples taken in 1993. No samples were collected during 1994.

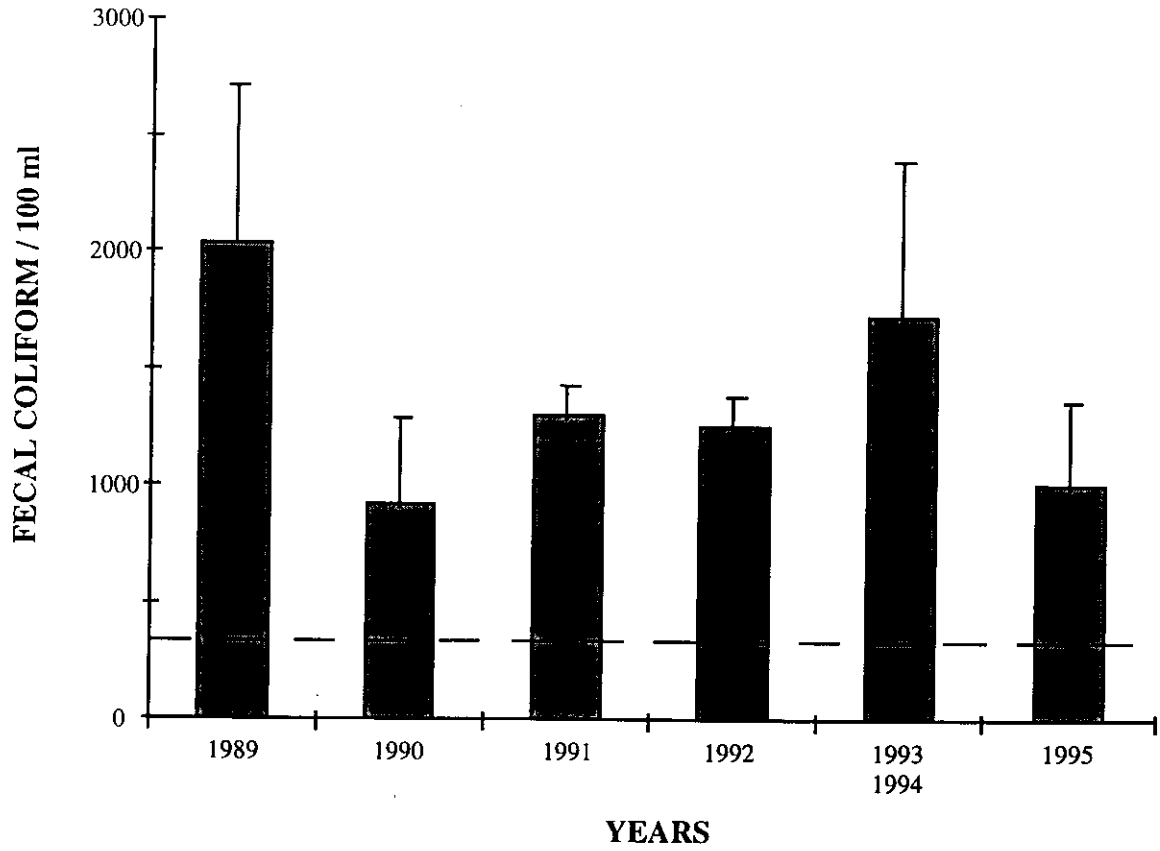

Figure 4: Yearly averages (+/- S.E.) of fecal coliform (LCMX) collected at the Plum Island site. The two samples collected during 1994 were combined with those taken in 1993. Note that the yearly averages are at least 2.5 time greater than the permit limit of 400 fecal coliform / 100 ml, daily maximum (– – –).